CHAPTER ONE

STOICHOMETRY

SELF-CHECK Ex 1.1

(a) → GIVEN

→ $N_2 + 3H_2 \longrightarrow 2NH_3$

- Moles of Nitrogen = ?
- Moles of NH_3 = 5.0 moles
- SOLUTION

According to chemical equation,

1 mole of N = 2 moles of NH_3

$\frac{1}{2}$ moles of N = 1 mole of NH_3

$\frac{1}{2} \times 5.0$ = 5 moles of NH_3

2.5 moles = 5 moles of NH_3

→ **Answer = 2.5 moles of N for 5 moles of NH_3**

(b) → GIVEN

→ Hydrogen moles = ?

→ NH_3 moles = 5.0

→ SOLUTION

3 moles of H = 2 moles of NH_3

$\frac{3}{2}$ moles of H = 5 moles of NH_3

$\frac{3}{2} \times 5$ moles of H = 5 moles of NH_3

7.5 moles of Hydrogen

Answer: 7.5 moles of Hydrogen

SELF-CHECK Ex 1.2

⇒ $2H_2 + O_2 \longrightarrow 2H_2O$

→ **GIVEN**

Mass of oxygen = ?

Mass of Hydrogen = 1.02×10^5 kg

Moles of H :- Moles = $\frac{\text{Mass}}{\text{Molar mass}} = \frac{1.02 \times 10^5}{2} = 51000$

→ **SOLUTION**

By comparison,

2 moles of Hydrogen = 1 mole of oxygen

moles of Hydrogen = $\frac{1}{2}$ moles of oxygen

51000 moles of Hydrogen = $\frac{1}{2} \times 51000$ moles of oxygen

= 25500 moles of oxygen

Mass of O_2 = No of moles of O_2 × Molar mass

= 25500 × 32

= 816000

= 8.16×10^5 kg oxygen

→ **Answer** = 8.16×10^5 kg oxygen

SELF- ASSESSMENT 1.3

(a) • GIVEN

Moles of oxygen = ?

Volume of oxygen = 50.0 dm^3

• FORMULAS

Molar volume = 22.4 dm^3

• SOLUTION

1 mole of O_2 = 22.4 dm^3 volume

$\frac{1}{22.4}$ mole of O_2 = 1 dm^3 volume

$\frac{1}{22.4} \times 50$ moles of O_2 = 50 volume

2.23 moles of O_2 = 50 dm^3 volume

• **Aswer:-** 2.23 moles of oxygen.

(b) • GIVEN

Volume = ?

N_2 moles = 0.80 moles

1 mole of N_2 = 22.4 dm^3 volume

0.80 = 22.4×0.80 dm^3

= 17.92 dm^3

• **Answer** = 17.92 dm^3 of volumed is occupied /coverd by 0.80 mole of N_2.

SELF-ASSESSMENT
1.4

(1) $Zn + S \rightarrow ZnS$

(a) • GIVEN

Zinc = 6.00g , moles of zinc = $\frac{6}{65.3}$ = 0.091

Sulphur = 4.00g , moles of S = $\frac{4}{32}$ = 0.125

Limiting reactant = ?

By comparison,

1 mole of Zn = 1 mole of ZnS

0.091 moles of Zn = 0.091

1 mole of S = 1 mole of ZnS

0.125 moles of S = 0.15 mols of S

As Zinc produces least no of products, It is the limiting reactant

Ans:- Zinc

(b) Mass of Zinc Sulphide = ?

• GIVEN

Moles of ZnS = 0.091 mols

Molar mass of ZnS = 97.38

• FORMULA

Mass = Moles × Molar mass

• SOLUTION

ZnS Mass = 0.091 × 97.38

= 8.861 g

• Ans:- 8.861g of ZnS

SELF - CHECK : 1.4

(2) **GIVEN**

Mass of Al = 15.8g

Mass of Br_2 = 55.6g

$2Al + 3Br_2 \rightarrow 2AlBr_3$

TO FIND

Limiting Reactant = ?

SOLUTION

Moles of Al = $\frac{15.8}{27}$ = 0.585

Moles of Br_2 = $\frac{55.6}{80 \times 2}$ = 0.3475

LIMITING REACTANT

By Comparison,

2 moles of Al = 2 moles of $AlBr_3$

=

1 mole of Al = $\frac{2}{2}$ moles of $AlBr_3$

0.585 moles " = 0.585 moles

3 moles of Br_2 = 2 moles of $AlBr_3$

1 mole of Br_2 = $\frac{2}{3}$ moles of $AlBr_3$

= $\frac{2}{3} \times 0.3475$ moles of $AlBr_3$

= 0.2317 moles of Br_2

Answer = Br_2 is the limiting reactant

(b) Mass of $AlBr_3$

Sol: Mass = Moles × Molar mass

= 0.2317 × 267

= 61.86 Ans

SELF - CHECK 1.5

Q1) (a)

• GIVEN

Glucose mass = 10g

• TO FIND

theoratical yield = ?

• SOLUTION

Moles of glucose = $\frac{10}{180}$ = 0.055 moles

1 mole of $C_6H_{12}O_6$ = 2 moles of C_2H_5OH

0.55 moles " = 0.55 × 2 "

= 0.11 moles of C_2H_5OH

Mass of C_2H_5OH = 0.11 × 46

= 5.11 g of C_2H_5OH

Theoratical yield = 5.11 g of C_2H_5OH

(b) Percentage yield = ?

" = $\frac{\text{Actual yield}}{\text{Theo yield}} \times 100$

= $\frac{0.664}{5.11} \times 100$

$= 12.99\ \%$

Percentage yield $= 12.99\ \%$ Ans

Q no: 2) • **GIVEN**

Mass of CO_2 = ?

Mass of Methane = 1250 g

• **SOLUTION**

Moles of Methane $= \frac{1250}{16} = 78.125$

1 mole of CH_4 = 1 mole of CO_2

78.1 " = 78.1 "

Mass of $CO_2 = 78.1 \times 44$

$= 3436.4$ Ans

(b) Actual yield = 3000 g

theoratical yield = 3436.4

Percentage yielde = ?

$P.Y = \frac{3000}{3436.4} \times 100$

$= 87.3\ \%$ Ans